

POSTER SESSION

1020 Computational Science: Data Mining

Sunday, March 07, 2004, 9:00 a.m.-11:00 a.m.

Morial Convention Center, Hall G

Presentation Hour: 10:00 a.m.-11:00 a.m.

1020-67**New Baroreflex Sensitivity Assessment Technique Dramatically Improves Clinical Applicability in Chronic Heart Failure**

Hedde Van de Vooren, Cees A. Swenne, Gian D. Pinna, Martin J. Schalij, Ernst E. Van der Wall, Leiden University Medical Center, Leiden, The Netherlands, Istituto Scientifico di Montescano, Montescano, Italy

Background. Baroreflex sensitivity (BRS) is a prominent noninvasive prognostic parameter in chronic heart failure (CHF). BRS can be measured noninvasively by computing the blood-pressure-to-heart-rate transfer function in the LF (0.05-0.15 Hz) band from a recording of the continuous arterial blood pressure (Finapres) and the ECG, made under 15/min metronome breathing. When the squared blood-pressure-to-heart-rate coherence in the LF band is below 0.50, BRS is usually considered invalid (it is assumed that BRS in such cases does not significantly differ from zero). In practice, low coherence is frequently seen in patients, hence this validity criterion renders noninvasive BRS measurement virtually impossible in, e.g., CHF.

Methods. We measured BRS in a group of 21 rehabilitating CHF patients (15 male, 6 female, mean±SD age 61.2 ± 11.4 yrs, NYHA-class 2.1 ± 0.7), to detect a possible difference between day 0 (control) and 2 (effect). We calculated BRS in the conventional way with the coherence criterion, and also according to an improved strategy in which 95% confidence intervals of BRS are computed (Pinna & Maestri, Med Biol Eng Comput 2001; 39: 338-347). This strategy does not only allow for a more correct decision about using/discarding a given BRS measurement, but facilitates also subsequent weighted statistical analysis of the valid BRS data.

Results. According to the coherence-based strategy only 4/21 (19%) patients had valid control-BRS values and 7/21 (33%) had valid effect-BRS values. Paired BRS comparison (control-effect) was only possible in 2/21 (10%) of the patients, and no meaningful statistical analysis could be made. Contrastingly, weighted statistics with the new confidence-interval based strategy revealed a significant ($P=0.016$) BRS increase from 3.57 ± 1.98 to 5.60 ± 2.79 ms/mmHg.

Conclusions. Our study demonstrates that the coherence-based strategy excluded greater part of the study group from the analysis. The new confidence-interval based strategy yielded in the same group a very significant BRS increase. This methodological improvement hence contributes greatly to the clinical applicability of noninvasive BRS assessment.

1020-68**Utility of an Online Clinical Database for Tracking Innovative Technology: The Academic Drug-Eluting Stent Experience**

David Scott Marks, Thomas A. Ratko, Karl A. Matuszewski, Michael J. Oinonen, Joseph P. Cummings, Medical College of Wisconsin, Milwaukee, WI, University HealthSystem Consortium, Oak Brook, IL

Background: Drug-eluting stents (DES) have been approved for marketing in the US since April of 2003. Due to manufacturing and distribution issues, they were initially available in limited quantity. To understand the manufacturer roll-out process, hospital implementation, and institution-specific practices, we utilized an administrative/cost database from the University HealthSystem Consortium (UHC), an alliance of 87 academic health centers in the US.

Methods: The UHC clinical database was queried for ICD/9 and DRG codes specific to DES for the second quarter (Q2) of 2003, corresponding to FDA approval. This database contains a comprehensive collection of procedure-specific data derived from discharge abstract summaries and UB-92 data for all inpatients at participating centers. DES usage data were compared to historical controls derived from the same database.

Results: 11,866 procedures involving coronary stents from 74 institutions performed in Q2 were analyzed, including 3,404 cases utilizing DES. Penetration of DES increased monthly and reached 44% by June, 2003. Prior analyses suggested adverse impacts to institution budget with this new technology, largely from incremental stent costs and inadequate reimbursement. Our retrospective analysis demonstrates more rapid penetration than predicted but with a lower than expected cost increase per case (\$1453 increase per DES procedure). Significant off-label usage of DES was noted. No differences in clinical demographics were found during the adoption phase. Ongoing analysis of 2003 data will be presented.

Conclusion: The UHC clinical database provides a rapid methodology for profiling technology dissemination and may be used to benchmark clinical practice outcomes such as institutional length of stay and costs. DES have shown rapid adoption despite supply issues and limitations in the clinical evidence base. Further analysis will provide insight into the source of the procedural cost savings as DES practice evolves following initial introduction.

1020-69**The Use of Electronic Medical Records and Data Mining to Facilitate Best Patient Care in an Outpatient Clinical Setting**

Roger J. Roper, J. Russell Bailey, Akinyele Aluko, Mark S. Kremers, Stephen A. McAdams, Mid Carolina Cardiology, Charlotte, NC

Background: Data mining thru the use of electronic medical records (EMR) and scanning programs has lead to the identification of 1,565 unique patients that may be at risk for sudden cardiac death (SCD) and meet the criteria of the Multicenter Automatic Defibrillator Implantation Trial II (MADIT-II) for the consideration of the placement of an implantable cardioverter defibrillator (ICD).

Methods: The electronic database for medical records was transferred via encrypted text and sent over secure file transfer protocol connection to a medical informatics company. A program was developed that can scan each medical record in its entirety and identify patients that meet the MADIT-II criteria of prior myocardial infarction and ejection fraction of 30%. A pilot validation study was performed prior to the full data transfer to ensure the accuracy of the program that yielded a 99.79% accuracy rate.

Results: Cardiologists have assessed 631 of the 1565 identified patients. There have been 43 electrophysiologist referrals, 109 T-wave alternans tests, 339 echocardiograms, 4 signal average electrocardiograms, 20 ICD implantations, 272 deemed ineligible after cardiologist reassessment, 21 patients who refused consideration of ICD therapy, 78 deaths prior to this assessment, and 22 who moved out of the area.

Conclusion: Data mining and scanning of the EMR has led to increased patient referral for electrophysiologist evaluation potentially resulting in improved patient care outcomes in this outpatient facility. The EMR aids the physician in the ability to identify patients who meet specific clinical criteria, or require reevaluation of treatment based on new recommendations.

1020-70**Automation Comparable to Human Variability for Detecting Left Ventricular Borders From DICOM Angiograms**

Florence H. Sheehan, University of Washington, Seattle, WA

BACKGROUND: We evaluated a new method for automatic border detection (ABD) of LV borders from angiograms by comparing its accuracy with manual tracing and human variability. **METHODS:** Our ABD uses trained decision-tree classifiers to distinguish the inside from the outside of the endocardial surface at end diastole (ED) and end systole (ES). The training was performed using a large data set of 294 ventriculograms whose borders had been manually traced by several different observers. We compared the cardiac parameters measured from automatically delineated borders with the results from manual tracing in 18 studies not used for training. We also compared the deviation between automated and manual analysis with human interobserver variability in 20 studies. **RESULTS:** Measurements agreed closely between automatic and manual segmentation for ED volume (155 ± 49 ml by ABD vs. 153 ± 45 manual, $p=NS$ by paired t test), ES volume (61 ± 24 ml by ABD vs. 65 ± 23 ml manual, $p=NS$), and ejection fraction (EF) ($57 \pm 9\%$ by ABD vs. $60 \pm 9\%$ manual, $p<0.04$). The mean absolute deviation of the automated method was similar to the absolute magnitude of variability between trained human observers (Table). **CONCLUSION:** Measurements of cardiac parameters made from borders detected by our method for automated ventriculographic analysis varied from human results to the same degree as human observers vary from each other. This method therefore may be useful for facilitating quantitative analysis of contrast ventriculograms for patient care.

Absolute Deviation by ABD vs. Human Interobserver Variability

Parameter	Variability	ABD Deviation	p
ED volume, ml	6±4	7±6	NS
ES volume, ml	9±5	7±5	NS
EF, %	5.0±3.0	5.7±3.7	NS

1020-71**Secure Heart Failure Database Development and Data Sharing**

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BACKGROUND: The clinic heart failure database at Dartmouth-Hitchcock Medical Center (DHMC) is proposed to be a central data repository of disease related records from both internal and external data sources. It maintains current records with diagnostic images, including ECG, ECHO, CT and MRI. The electronic patient record can be accessed from a web-based interface allowing different clinicians to input data and share their knowledge about a specific patient. Also, this database can be integrated with information retrieval and mining techniques for the purpose of clinic quality assurance.

METHOD: The heart failure database is built with postgresql + PHP/Javascript for robustness and portability to multiple platforms. Data transmission is encrypted using the md5 protocol. External data request are automatically verified by the authentication server. IP control, firewall, and system logs are used as advanced security proof. With respect to HIPAA rules, we apply role-based access control in user privilege assignment. Moreover, sensitive fields of a medical record will be laundered to reduce the risk of unintentional disclosure of a patient's private information.

RESULTS: The clinical heart failure database is defined to support a full range of data management including: patient demographics, general medication history, cardiology tests (textual/numeric/image data from angiography, MI, PCI, CABG, etc.), diagnosis/current medication, clinician work list, and user administration. To overcome the discrepancy